

**Analysis of Pre-1914 Diversions By Madera Irrigation District  
and Madera Canal & Irrigation Company**

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The purpose of this analysis is to determine what effect, if any, storage of Madera Irrigation District's pre-1914 water in Hensley Lake has had on the amount of pre-1914 diversions following construction of Hidden Dam.

Big Creek Diversion Analysis

MID's pre-1914 Big Creek diversion right is 50 cfs from December 1 through March 31. The flow rate reduces to 20 cfs from April 1 through April 30 and from May 1 through July 15, the diversion right is back to 50 cfs.

Historically, MID has always diverted as much available water as it is entitled to under its pre-1914 right both under pre-dam and post-dam conditions. There would not be any injury to diverters on Big Creek downstream of MID's diversion since MID had always diverted as much water as it was entitled to under its rights. The Big Creek diversion records were used to demonstrate that the diversion flows for the period before the dam was built and the period after the dam was built had similar flow amounts and distribution. Flow records from both the USGS Gage# 11267350 (1969-1977, 1987-2010) and the adjacent MID operated gage (1962-1969, 1977-1987) (see Table 1) and the Wilcoxon Rank Sum Test were utilized to perform the comparisons between the two sets of flow records (i.e., pre-dam and post-dam).

Hidden Dam (i.e., Hensley Lake) was completed in 1975. However, normal dam operations did not start until 1977. Based on the Big Creek diversion records, the average annual diversion from December through July under pre-dam conditions (1963-1976) and post-dam (1977-2010) conditions are 8,864 AF and 8,368 AF, respectively, as shown in Figure 1. The difference in diversion amounts between the two averages is minimal (i.e., about 6 percent). Additionally, the results of the Wilcoxon Rank Sum Test indicate that the two Big Creek annual diversion flow sample populations (i.e., pre-dam: 1963-1976 and post-dam: 1977-2010) have equivalent probability distribution and are not significantly different from each other at the significance level of 5%. The above statistical analysis shows that historically, even with the storage facility in place, MID did not divert any more water than it was diverting before the dam was built.

### Soquel Creek

The circumstances for MID's Soquel pre-1914 diversion right on North Fork Willow Creek are different from those of its pre-1914 Big Creek diversion right. Soquel Creek pre-1914 flows since 1977 have only been diverted to the Fresno River in those rare occasions when PG&E is conducting repairs on its power plant at Bass Lake. MID had been diverting its Soquel pre-1914 water with flow rate up to 50 cfs from North Fork Willow Creek at the Soquel Diversion several miles above Bass Lake. The diverted Soquel water would then be directed toward the Fresno River via Soquel Ditch. Since 1977, however, MID has been routing its Soquel water through Bass Lake for power generation by PG&E rather than diverting it to the Fresno River. This water is then delivered to MID via Millerton Lake. This current diversion has been made possible by MID's agreements with PG&E for use of MID pre-1914 water for power generation and with USBR through a Warren Act Contract at Millerton Lake for conveyance and pass-through via Millerton Lake to MID. Both of these agreements took effect in 1977, which is about two years after the completion of the Hidden Dam and about the same time the dam was fully operational. Consequently, Soquel Creek pre-1914 flows since 1977 have only been diverted to the Fresno River in those rare occasions when PG&E is conducting repairs on its power plant at Bass Lake. As a result, there is only a short post-dam data set of flow into Hidden Dam for the Soquel pre-1914 diversion flow comparison analysis.

Tables 2 and 3 are flow data collected by MID on the Soquel Ditch and North Fork Willow Creek below the Soquel Diversion from 1960 to 2010 and 1965 to 2010, respectively. The flow data records show that MID began routing its Soquel water in 1977 through Bass Lake for power generation and thence through Millerton Lake for MID delivery. However, based on the data, it appears that MID continued to divert at least portions, if not all, of the available Soquel water to the Fresno River for another three years after 1977. When the Soquel right was not diverted to the ditch, minimal daily flows of about 1 to 2 cfs were normally maintained in the Soquel Ditch for fishery purposes. Nevertheless, as indicated above, there continue to be occasions when MID would need to divert its full or partial Soquel water into Fresno River due to various power generation issues and emergencies of PG&E at Bass Lake.

MID's Soquel diversion right is located at the Soquel Diversion on North Fork Willow Creek. At that location, MID could elect to either divert all of its pre-1914 water into the Fresno River via the Soquel Ditch or only a portion, and allow the remaining balance of MID's pre-1914 Soquel water to pass through Millerton Lake. In accordance with MID's pre-1914 rights, up to 50 cfs of available water in North Fork Willow Creek is allocated to MID at the Soquel Diversion location whether it is diverted off into Fresno River or remains in Willow Creek until it get delivered to MID through Millerton Lake.

Based on the comparison of historical diversions of pre and post Hidden Dam construction, the impacts on the water right holders below the Soquel Diversion are essentially the same regarding available water supply whether Soquel water is diverted into Fresno River for storage or left in Willow Creek to be re-routed through Millerton Lake. Furthermore, the ability to store Soquel water in Hensley Lake does not cause any injury to water right holders downstream of Soquel Diversion based on the analysis above. In the same manner, there is also no difference in the amount of Soquel water diverted between pre-dam

or post-dam conditions because MID had always diverted as much as it was allowed under its pre-1914 right at the Soquel Diversion as described above.

In summary, historical diversion of the District's pre-1914 water rights at Big Creek and Soquel Creek are essentially the same both prior to and after construction of Hidden Dam. As indicated in the above analysis, the District has taken its full pre-1914 water supply when available within its designated season of diversion.

Table 1

## BIG CREEK DIVERSIONS

## Big Creek Diversion (AF)

Data Sources: USGS #11267350 (Oct 1969- Jun 1977, Apr 1987- Dec 2010) , MID Gage (Aug 1962-Sep 1969 , July 1977 - Mar

Year	Jan	Feb	Mar	1987 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (AF)	Dec-Jul	Totals (AF)
1962	0	0	0	0	0	0	0	122	72	177	133	196	700	xx-62	0
1963	396	1,321	1,343	1,942	2,348	1,613	713	305	192	216	636	585	11,608	62-63	9,871
1964	1,276	458	809	1,587	1,696	891	329	132	92	127	435	622	8,454	63-64	7,629
1965	1,133	1,039	1,500	2,110	2,813	2,618	929	391	233	207	1,282	1,692	15,947	64-65	12,764
1966	998	664	1,553	1,388	1,730	705	292	153	127	115	375	1,188	9,287	65-66	9,021
1967	1,369	1,567	1,741	1,559	1,648	2,388	2,136	750	209	189	418	355	14,330	66-67	13,596
1968	101	524	920	1,018	1,226	411	148	161	135	182	304	1,200	6,330	67-68	4,704
1969	999	723	1,013	320	2,150	2,802	1,583	382	286	468	455	803	11,985	68-69	10,791
1970	2,202	1,817	2,271	1,545	2,081	1,186	300	113	97	113	419	518	12,661	69-70	12,204
1971	700	744	1,436	2,184	2,263	1,630	282	131	124	103	370	656	10,623	70-71	9,757
1972	370	632	2,291	1,010	1,107	603	210	143	22	156	231	359	7,135	71-72	6,879
1973	478	515	684	2,075	3,324	1,370	191	193	109	63	289	158	9,448	72-73	8,996
1974	51	39	23	205	2,167	1,496	175	136	119	213	257	422	5,303	73-74	4,314
1975	450	486	824	1,051	3,453	2,745	555	119	95	108	106	380	10,372	74-75	9,987
1976	317	357	771	582	824	255	95	16	64	114	109	122	3,625	75-76	3,580
1977	141	137	75	251	373	219	47	2	15	48	131	1,005	2,445	76-77	1,366
1978	1,332	2,482	3,029	3,423	3,555	3,169	1,190	296	285	563	630	1,501	21,455	77-78	19,185
1979	786	2,483	3,158	3,062	3,163	1,732	499	240	180	184	262	738	16,489	78-79	16,385
1980	693	2,082	2,414	2,789	3,199	2,846	1,472	1,172	612	391	406	840	18,916	79-80	16,234
1981	563	854	905	2,055	1,740	601	158	45	62	240	822	935	8,980	80-81	7,715
1982	2,015	2,344	2,426	1,463	972	2,640	1,079	458	385	789	1,283	1,132	16,988	81-82	13,875
1983	764	599	689	655	676	617	545	991	474	233	1,667	2,124	10,034	82-83	5,677
1984	2,101	1,874	2,135	2,317	2,188	1,368	416	228	226	1,078	1,174	1,909	17,014	83-84	14,522
1985	1,692	1,789	2,475	1,758	1,732	627	151	54	8	133	430	1,135	11,984	84-85	12,133
1986	1,295	857	2,338	1,575	2,254	1,662	289	59	39	92	194	306	10,962	85-86	11,406
1987	1,061	812	946	963	713	116	55	6	0	80	147	267	5,167	86-87	4,973
1988	339	550	972	1,079	1,037	464	77	2	0	2	94	144	4,760	87-88	4,786
1989	196	358	1,513	1,847	815	264	61	14	8	15	117	155	5,364	88-89	5,198
1990	178	303	1,100	1,466	761	359	70	23	21	10	65	46	4,402	89-90	4,392
1991	101	113	480	1,349	2,146	1,285	228	11	5	43	131	161	6,053	90-91	5,747
1992	276	389	962	2,170	1,150	317	175	40	24	77	81	263	5,924	91-92	5,600
1993	1,274	1,083	2,120	2,579	3,072	2,648	691	41	21	11	206	299	14,045	92-93	13,730
1994	203	249	832	1,238	1,523	328	63	25	20	27	192	151	4,851	93-94	4,734
1995	643	516	387	191	163	1	32	149	206	147	132	126	2,693	94-95	2,084
1996	47	37	20	1,718	2,360	1,458	260	25	17	46	711	1,922	8,619	95-96	6,025
1997	125	10	411	1,739	1,878	1,033	157	10	10	32	99	352	5,857	96-97	7,277
1998	715	840	1,593	1,944	3,160	3,449	1,373	34	17	15	427	978	14,546	97-98	13,426
1999	877	1,414	1,408	1,753	2,465	1,369	211	11	10	9	77	138	9,744	98-99	10,477
2000	840	1,365	1,793	2,537	2,569	1,082	150	11	10	22	210	212	10,801	99-00	10,474
2001	263	84	1,113	1,468	1,761	369	93	24	18	26	154	352	5,725	00-01	5,363
2002	422	95	8	17	25	578	449	677	837	1,273	1,031	1,870	7,284	01-02	1,946
2003	677	837	1,273	1,031	1,870	1,319	195	47	48	27	8	461	7,794	02-03	9,074
2004	320	514	1,202	1,051	1,103	365	72	8	3	7	6	376	5,027	03-04	5,088
2005	1,040	1,375	2,547	2,138	1,321	2,426	835	157	159	58	12	1,073	13,141	04-05	12,058
2006	1,642	1,212	1,619	1,075	2,307	1,724	394	18	13	2	15	287	10,307	05-06	11,045
2007	298	664	1,307	1,075	800	227	52	2	7	6	4	100	4,541	06-07	4,709
2008	214	348	1,028	1,127	2,686	712	94	1	2	4	0	232	6,447	07-08	6,309
2009	640	1,388	1,160	2,686	912	204	34	1	1	0	291	421	7,738	08-09	7,256
2010	421	509	553	271	202	1,251	603	2	3	0	0	909	4,722	09-10	4,230



Figure 1

## Big Creek Diversion Flows (Dec-Jul) and Hidden Dam Flood Releases

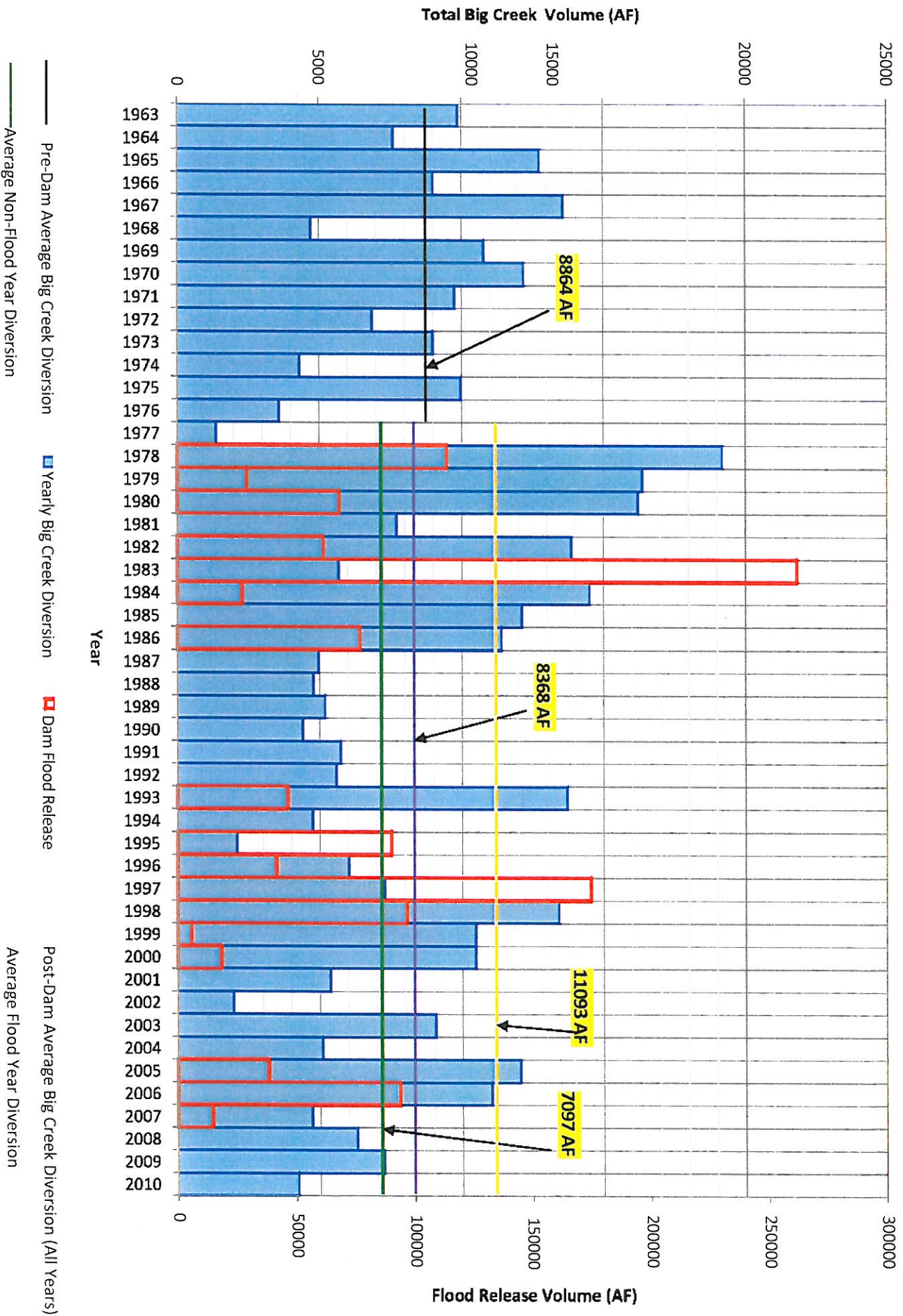


Table 2 Monthly Soquel Ditch Flow Data

Soquel Diversion Near Sugar Pine (AF)

Data Sources: MID Gauge (Nov 1960 - Dec 2010)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (AF)	Oct-July	Total (AF)
1960											141	160	301	xx-60	
1961	214	250	525	228	-	-	-	-	-	89	145	201	1,652	60-61.	1,518
1962	125	201	359	1,619	2,426	2,348	896	98	-	199	207	321	8,799	61-62.	8,409
1963	277	563	1,440	1,910	2,239	1,968	797	138	16	163	623	518	10,652	63-64.	9,921
1964	571	445	604	1,198	1,602	1,166	448	2	-	126	154	568	6,884	64-65	7,338
1965	842	683	357	1,579	166	815	464	-	-	56	157	139	5,258	65-66	5,754
1966	366	-	591	2,013	2,453	692	266	16	-	78	296	496	7,267	66-67	6,733
1967	585	569	1,781	965	914	2,152	1,826	841	125	321	158	337	10,574	67-68	9,662
1968	307	525	848	1,450	1,468	564	199	47	81	68	111	260	5,928	68-69	6,177
1969	2,140	1,410	1,150	2,940	2,430	2,120	1,940	408	296	371	244	203	15,652	69-70	14,569
1970	124	66	64	1,350	2,050	1,430	524	101	35	136	406	522	6,808	70-71	6,426
1971	620	732	1,120	1,910	2,710	2,400	827	46	8	87	288	486	11,234	71-72	11,383
1972	465	510	1,180	1,680	1,810	805	317	44	12	106	193	341	7,463	72-73	7,628
1973	538	603	734	1,570	2,220	1,920	683	297	176	254	487	522	10,004	73-74	8,908
1974	644	435	712	914	2,130	1,570	785	47	23	86	107	326	7,779	74-75	8,453
1975	346	600	816	865	2,190	2,900	1,360	73	43	300	336	367	10,196	75-76	9,596
1976	294	348	616	926	1,040	359	121	16	59	97	94	89	4,059	76-77	4,707
1977	167	147	166	310	386	254	30	-	39	76	74	61	1,710	77-78	1,740
1978	275	3,210	3,525	3,043	3,320	2,997	62	52	50	59	57	45	16,695	78-79	16,643
1979	59	64	59	57	1,715	1,103	61	37	36	41	38	20	3,290	79-80	3,279
1980	5	28	709	2,438	1,642	121	127	138	130	74	58	47	5,517	80-81	5,169
1981	59	42	37	95	112	36	88	74	61	157	84	74	919	81-82	648
1982	233	82	55	124	108	98	98	92	86	94	103	66	1,239	82-83	1,113
1983	61	55	61	59	61	59	61	118	92	55	58	59	799	83-84	680
1984	60	57	81	43	54	59	47	39	61	56	53	43	653	84-85	573
1985	48	54	116	51	113	75	54	38	47	51	76	29	752	85-86	663
1986	51	57	29	54	265	291	81	104	82	106	102	108	1,330	86-87	984
1987	98	90	70	48	94	60	52	51	113	145	170	155	1,146	87-88	828
1988	153	129	124	108	51	50	47	61	54	51	63	60	951	88-89	1,132
1989	57	42	27	17	36	56	49	55	62	36	35	70	542	89-90	458
1990	67	106	64	58	61	60	59	29	5	-	33	91	633	90-91	616
1991	89	57	52	48	44	60	61	74	64	18	104	104	775	91-92	535
1992	101	113	61	60	61	61	61	40	60	48	69	81	816	92-93	744
1993	127	91	62	27	129	59	61	53	56	52	60	61	838	93-94	754
1994	61	56	61	60	55	52	50	31	21	31	60	61	599	94-95	568
1995	91	56	121	60	61	60	43	164	50	329	60	53	1,148	95-96	644
1996	43	15	61	60	61	60	61	28	12	18	60	61	540	96-97	803
1997	23	-	-	-	61	60	61	61	60	61	60	61	508	97-98	344
1998	24	25	86	104	76	60	61	61	63	120	130	107	917	98-99	618
1999	143	136	70	65	58	48	75	62	60	61	60	61	899	99-00	952
2000	61	67	88	55	51	55	58	61	60	61	60	61	738	00-01	617
2001	61	56	61	60	61	60	61	52	54	44	48	49	667	01-02.	602
2002	49	44	41	48	67	67	67	62	60	61	60	61	687	02-03.	524
2003	61	55	61	60	379	402	61	61	60	61	60	61	1,382	03-04.	1,261
2004	61	57	61	60	61	60	61	61	48	117	113	368	1,128	04-05.	603
2005	61	57	61	60	61	60	61	61	60	11	11	11	575	05-06.	1,019
2006	1	-	-	-	1,234	-	-	-	-	-	-	-	1,235	06-07.	1,268
2007	-	-	-	-	-	-	-	-	-	31	-	31	62	07-08.	-
2008	31	29	31	30	31	30	31	31	30	31	30	31	366	08-09.	275
2009	31	28	31	204	711	-	-	-	-	-	-	-	1,004	09-10.	1,096
2010	-	-	-	-	-	-	-	-	-	-	-	-	-	10-11.	-



Table 3 Monthly North Fork Willow Creek Flow Data

1966	1,037	799	1,519	1,764	398	174	106	162	167	88	320	3,863	10,398	65-66	8,994.45
1967	1,068	1,180	3,895	1,914	9,384	8,557	2,348	306	512	293	338	345	30,140	66-67	32,617.98
1968	320	528	434	483	289	131	91	142	67	142	319	328	3,274	67-68	3,251.90
1969	5,357	1,593	1,466	5,462	12,704	6,928	1,220	393	191	436	357	792	36,900	68-69	35,520.20
1970	3,493	1,874	2,426	1,277	1,753	390	160	193	176	90	406	321	12,561	69-70	12,959.40
1971	293	352	964	1,094	1,668	930	159	335	246	196	251	440	6,930	70-71	6,279.67
1972	227	308	1,082	575	942	437	115	181	211	145	186	234	4,643	71-72	4,572.89
1973	347	452	525	1,757	6,891	2,282	253	144	103	203	649	613	14,218	72-73	13,071.27
1974	1,145	698	2,442	2,777	4,584	1,761	206	348	200	240	316	319	15,034	73-74	15,077.75
1975	290	610	773	632	5,623	4,824	314	548	327	498	261	189	14,889	74-75	13,940.63
1976	156	179	329	436	542	117	91	177	160	122	97	74	2,479	75-76	2,797.09
1977	113	115	126	106	148	109	61	40	22	25	101	1,240	2,207	76-77	1,070.66
1978	1,715	1,010	3,051	3,183	6,714	7,650	3,443	762	853	393	360	458	29,593	77-78	28,133.12
1979	973	1,067	2,150	4,036	6,549	1,954	876	374	209	363	455	494	19,502	78-79	18,817.59
1980	9,031	6,101	5,502	2,900	5,607	6,797	2,214	647	346	277	305	423	40,150	79-80	39,463.93
1981	579	676	1,021	1,960	2,452	692	211	115	74	227	1,167	1,335	10,508	80-81	8,595.37
1982	1,672	3,937	3,907	10,495	12,373	5,280	1,894	819	757	1,096	2,043	3,168	47,441	81-82	42,287.60
1983	3,174	3,943	7,299	6,724	10,641	12,732	6,678	1,652	742	686	2,556	4,257	61,085	82-83	57,497.85
1984	3,104	2,265	2,729	2,941	3,330	1,335	506	197	183	384	795	677	18,446	83-84	23,710.02
1985	613	832	1,315	3,287	3,326	1,126	329	173	242	288	620	1,297	13,447	84-85	12,683.50
1986	1,833	9,876	9,279	5,589	5,389	3,340	930	395	383	357	230	295	37,896	85-86	38,439.67
1987	448	861	1,410	2,085	1,333	353	172	89	56	129	241	344	7,519	86-87	7,544.53
1988	820	607	1,182	1,835	1,920	726	201	130	76	75	196	287	8,056	87-88	8,004.26
1989	368	628	1,870	2,817	1,466	504	207	133	172	313	292	226	8,996	88-89	8,418.05
1990	351	394	1,450	2,660	1,371	553	210	105	76	78	109	111	7,468	89-90	7,819.24
1991	249	264	1,690	1,791	3,945	2,352	484	227	141	277	219	195	11,835	90-91	11,073.92
1992	261	643	932	2,886	1,530	409	390	108	67	336	269	492	8,323	91-92	7,741.29
1993	3,210	1,724	3,987	5,782	11,286	6,524	1,390	587	367	312	298	391	35,855	92-93	34,998.27
1994	371	490	1,045	1,442	1,662	652	215	110	111	346	482	504	7,431	93-94	6,878.28
1995	3,268	1,821	8,184	7,202	14,027	13,037	5,268	944	520	268	306	844	55,689	94-95	54,138.05
1996	1,000	3,943	4,054	5,328	7,295	2,424	849	371	204	257	2,035	4,810	32,570	95-96	26,311.14
1997	16,500	4,175	4,183	4,013	5,292	1,569	659	327	227	248	328	434	37,955	96-97	43,493.75
1998	1,225	1,845	2,749	3,499	6,799	9,080	5,353	1,118	500	450	598	768	33,984	97-98	31,559.80
1999	1,200	2,001	1,853	2,981	4,961	2,148	732	340	200	188	299	245	17,147	98-99	17,690.78
2000	1,791	2,095	2,444	3,995	5,460	1,771	562	300	247	380	371	322	19,736	99-00	18,848.33
2001	559	1,155	1,548	2,515	4,548	855	342	168	114	140	394	893	13,232	00-01	12,595.64
2002	948	857	1,496	2,991	3,086	1,092	298	131	102	102	1,010	1,251	13,364	01-02	12,195.37
2003	904	1,103	1,763	2,515	4,564	1,999	416	275	166	144	283	778	14,911	02-03	15,628.17
2004	871	836	2,212	2,590	2,011	554	209	114	83	637	510	786	11,415	03-04	10,489.19
2005	2,479	1,952	3,459	3,943	11,786	8,025	2,271	610	346	316	322	2,076	37,585	04-05	35,849.06
2006	2,216	1,987	3,114	5,790	8,765	4,487	1,537	675	295	318	330	443	29,956	05-06	30,609.92
2007	558	1,178	1,916	2,102	1,490	399	157	74	73	127	127	194	8,394	06-07	8,890.31
2008	686	444	801	1,757	3,181	1,058	335	119	97	132	261	352	9,223	07-08	8,709.22
2009	1,086	1,666	1,918	2,773	5,234	1,561	503	204	133	402	242	547	16,269	08-09	15,485.95
2010	1,077	952	1,628	3,967	5,738	8,390	1,829	605	204	655	593	3,408	29,046	09-10	24,772.96